

EMINENT
AMERICAN CHEMISTS

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EMINENT AMERICAN CHEMISTS

A Collection of Portraits of Eminent Americans in the Field of Chemistry from the Earliest Days of the Republic to the Present, together with Short Sketches of the Work of Each.

Compiled and Edited

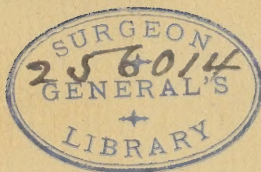
by

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INTRODUCTORY

IN PRESENTING to American students of chemical science this collection of the likenesses of those upon whom the development of chemistry in America has so largely depended, two thoughts have been uppermost in the mind of the compiler. While admitting the comparative youth of American civilization, we of America are perhaps too prone to look beyond the seas for true greatness in science and to damn with faint praise the deeds of our own countrymen. Even those who have been themselves intimate with the great part Americans have played in the development of chemistry are given to this fault. Recognition has been given many of those who have been prime movers in this development, but there is still lacking that broad public recognition which Europe has given her eminent scientists. If this compilation of the portraits of a few of the most eminent of American chemists can assist in gaining some measure of public recognition for American chemistry, a large part of its object will have been accomplished.

Perhaps of even greater importance than recognition by the country at large and particularly by the older generation is the inspiration which the deeds of truly great men may be to the rising generations of American children. From our earliest childhoods we carry the examples of Washington and Lincoln in government, Poe and Longfellow in literature, Fulton and Edison in invention, in our minds as ideals to emulate. Yet so far no definite effort has been made to present to our young men and young women the examples of those of our countrymen who have achieved true greatness in science. If this compilation of portraits can add in ever so slight a degree to the ideals of American children it will have made the task of getting it together well worth while.

The list of those included has been very carefully chosen with the idea of including those throughout the life of our country whose contributions to chemistry have placed them in positions of unquestionable eminence. In doing this the advice of eight men, whose

judgment might be trusted in such a selection, and to whom the compiler is much indebted, was sought and freely given. In order to prevent the compilation from becoming unwieldy, it was necessary to reduce the number of individuals included to a low minimum. For this reason many have been omitted who might have been included with equal justice, but it is hoped that a subsequent enlargement of the set may be called for which will make it possible to overcome this difficulty.

The short notes about the work of each man have been included particularly for the benefit of those who have not been fortunate enough to know otherwise of the deeds of these men. The sketches have purposely been made concise for the reason that so many valuable sources of further information exist that it was thought needless to repeat what had already been done by more able hands elsewhere. They are not complete in detailing the lives of those they discuss nor in most cases do they even approach completeness except in so far as they point out the outstanding characteristics of the work of each.

Drs. E. C. Franklin, E. F. Smith, F. P. Venable, Julius Stieglitz, Chas. H. Herty, William McPherson, C. A. Browne and Lyman C. Newell kindly assisted in selecting the list for inclusion. Drs. Smith, Browne and C. E. Munroe very graciously loaned portraits and autographs from their collections. Dr. Horace G. Byers offered valuable suggestions in connection with the sketches of each man. Mr. H. E. Howe assisted in many ways and without his help the accomplishment of the task would have been impossible. To all of these gentlemen and to those living who supplied portraits of themselves, the compiler wishes to express his sincere appreciation.

D. H. Killeffer.

New York, April 9, 1924.

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*Note: Portraits and sketches are bound in the order of the age of the subjects.
Numbers refer to that order.

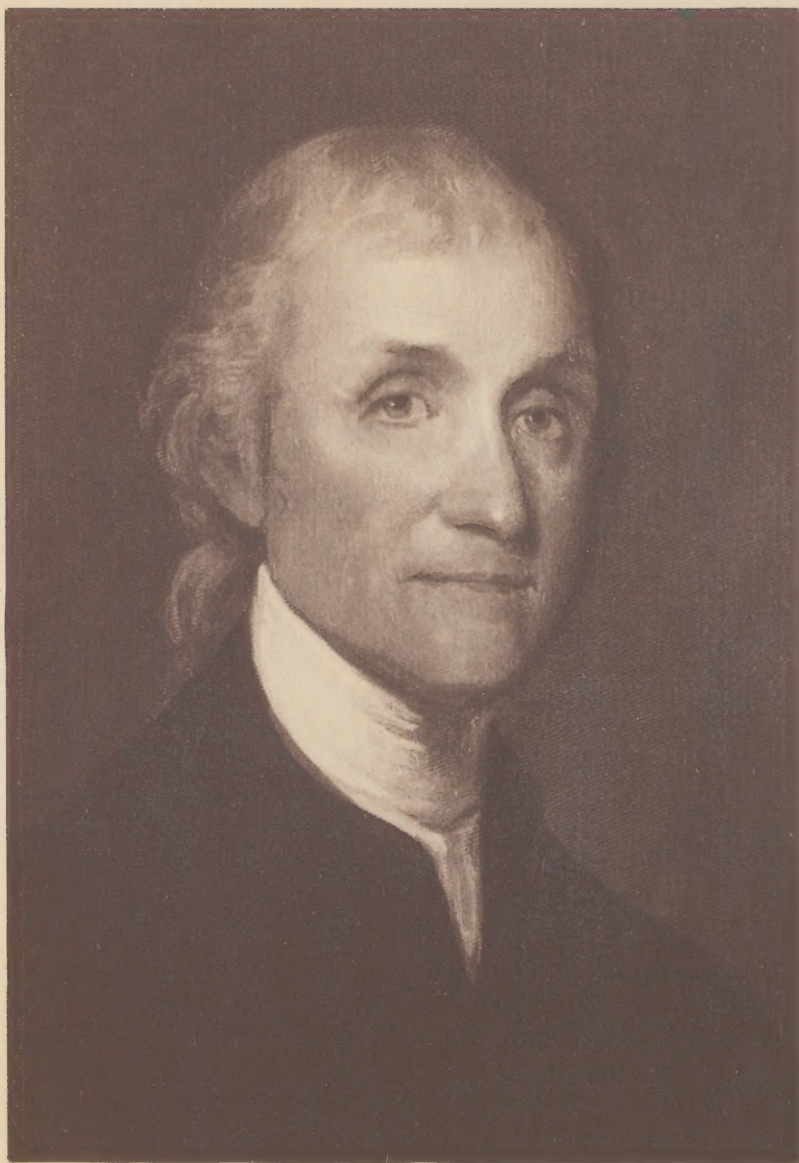
JOSEPH PRIESTLEY.

(1733-1804)

The unpopularity of Priestley's views on religious and political liberty forced him to emigrate from his native England to Northumberland, Pennsylvania, in 1794. Already famous for his achievements in the chemistry of gases, he was asked to become professor of chemistry at the University of Pennsylvania and at the University of Virginia, which Thomas Jefferson was at that time planning. He declined both offers, preferring to spend his declining years planning a school of his own at Northumberland—which never materialized—and making occasional visits to Philadelphia, where he was the inspiration of a group of young chemists of the time. These young men, particularly Hare and Silliman, later became the leaders of chemical thought in America.

“Chemists remember him as the discoverer of oxygen, ammonia, hydrogen chloride, sulfur dioxide, nitrous oxide and various other gases—as the greatest pioneer, so to speak, in that branch of our science known as pneumatic chemistry. Yet Priestley was more than a chemist. If a clergyman were asked, he might say, according to his school of belief, that Joseph Priestley was either a great heretic, or a great teacher of liberal religion. A student of politics might state that Priestley is to be remembered for his part in the great democratic movement which reached its climax in the American and French Revolutions. An inventor might tell you that Priestley's fame rests chiefly upon his invention of soda water, for which he won the Copley Medal. A philanthropist might add that Priestley, from the reforms which he instituted in education and in the laws governing dissenters, was a great humanitarian. Similarly a plant physiologist, an historian of science, a student of letters and a sociologist might each claim Joseph Priestley as his own. * * * * Theology was his vocation and chemistry only a major avocation. What this versatile genius might have accomplished, had he devoted all his energies to chemistry, is difficult to imagine.”

C. A. BROWNE.



J. Priestley

BENJAMIN THOMPSON, COUNT RUMFORD.

(1753-1814)

"A native of Massachusetts and alumnus of Harvard College. The first great chemist of American birth. By the discovery of the transformation of mechanical force into heat, he laid the foundation for the theory of the conservation of energy. His studies in the economy of fuel consumption represent the first conscious effort toward the conservation of natural resources. He was a pioneer in steam-heating and domestic sanitation. He was a pathfinder in constructive charity. Driven hence, as was Priestley hither, by neighborly intolerance, he became a dweller in many lands and a benefactor to each. Bavaria owed him an administration of unprecedented efficiency and a military system based on the manhood of the private soldier. To England he gave the Royal Institution, the home of Humphrey Davey and of Michael Faraday. At Harvard College he founded the chair made famous by Eben Horsford and Wolcott Gibbs. America received at his hands its first endowment for the encouragement of research in the exact sciences."

—Dedicatory Tablet in Rumford Hall, the Chemists' Club, New York.



Rumford

BENJAMIN SILLIMAN.

(1779-1864)

Educated as a lawyer, Benjamin Silliman, the Elder, became Yale's first professor of chemistry and America's first great scientific publicist. In defending the rights of his bosom friend, Robert Hare, to the invention of the compound blowpipe, he realized the necessity of having means of publication in America of the discoveries of American scientists and founded the *American Journal of Science and Art*, the first permanent scientific publication in America. Through this and through his teaching, his influence on scientific progress in this country has probably been greater than that of any other one man. The journal which he founded has continued for more than a hundred years under the editorship of members of his own immediate family. He was a great teacher and was much sought after as a popular lecturer. He was the originator of university extension work through his lectures to groups of working men in New Haven.

He was the first to produce hydrofluoric acid in America and discovered bromine in American brines. With the aid of Hare's "deflagrator" he demonstrated the fact that carbon was volatilized in the electric arc. At one time he was employed by the government to investigate the cane sugar industry and was much interested in the application of chemistry to industry. His attainments as an editor and teacher were of such importance that his original investigations suffer by comparison.

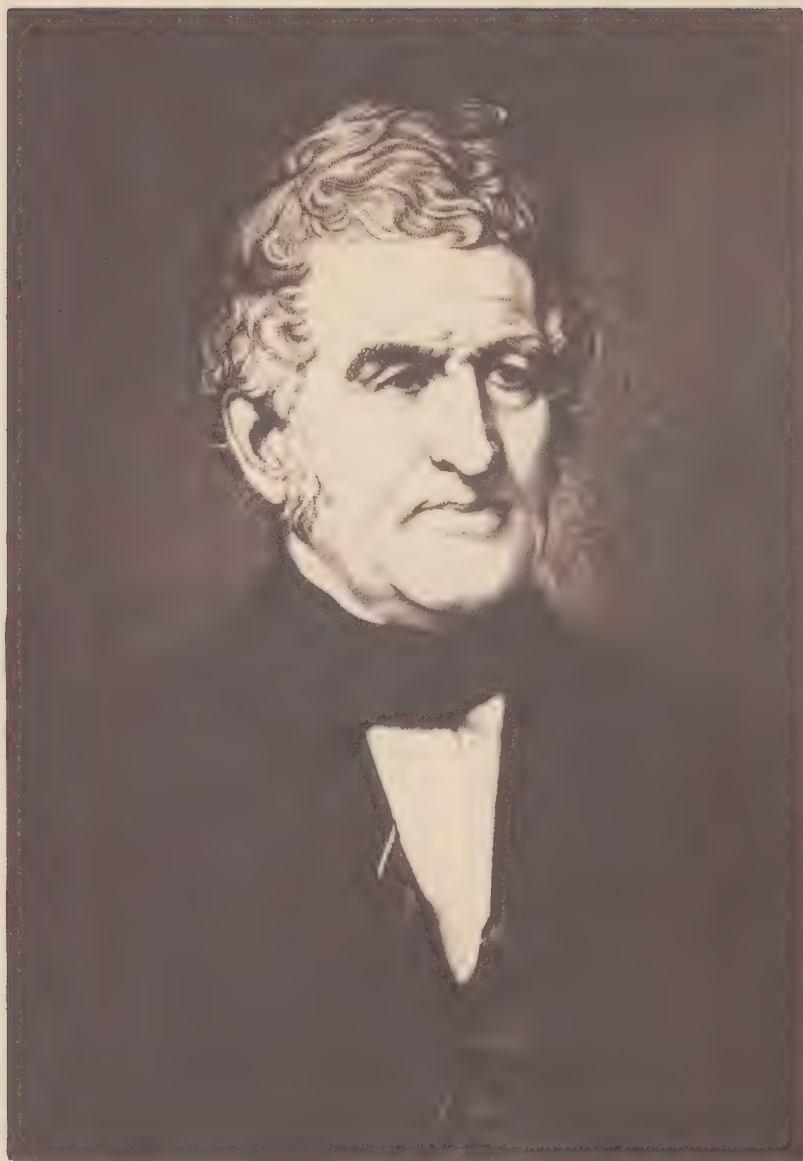


B Sittman

ROBERT HARE.

(1781-1858)

As Priestley was the father of Pneumatic Chemistry, so was Hare father of Electro-Chemistry. With the aid of electric batteries—which he devised—he operated the first electric furnace in which he prepared calcium carbide, graphite and phosphorus, and with the same batteries he succeeded in preparing metallic calcium by electrolysing a solution of its chloride. His first and probably his greatest discovery was that of the oxy-hydrogen blowpipe, through the use of which the calcium light, and the fusion of platinum, alumina, lime, magnesia and other refractory substances were made possible. It is upon the principle of Hare's blowpipe that modern oxy-acetylene blowpipes, so important in welding and cutting iron and steel today, are based. Of an inventive turn of mind and an indefatigable experimenter, Hare worked in many fields and enriched each with the results of his efforts. The first use of platinized asbestos as a catalytic agent in the synthesis of ammonia is to be credited to him. Practically his entire life was spent in Philadelphia where he was born, and where he received his education and later taught in the Medical School of the University of Pennsylvania.



Prof Hare

JAMES CURTIS BOOTH.

(1810-1888)

The first American industrial chemist. Through the efforts of Booth and his associates, the iron and steel industries of America were first placed on a logical basis of chemical control, from which example many other industries have profited. His laboratory in Philadelphia was the first established in this country for the teaching of analytical and industrial chemistry and was the first American commercial laboratory. His geological investigations were among the first undertaken in the Pennsylvania coal fields. As melter and refiner of the U. S. Mint, he devised the nickel alloy from which the one cent pieces of 1856 were made, replacing the large copper coins before that time, and he also introduced the present bronze alloy. It was during his term in this important office that the discovery of gold in California was made and he devised and put into successful operation the methods of refining of the immense amounts of bullion which poured into the mint from this source. With Edgar F. Smith he shares the distinction of having served as president of the American Chemical Society for three terms.



J. M. Booth

JOHN LAWRENCE SMITH.

(1818-1883)

Trained in medicine, Smith became a chemist through the fact that he chanced to pass the door of the illustrious Liebig at Giessen while on a walking tour from Paris where he was studying medicine. His dissertation on the question of whether arsenic was normally present in the human body was his most important early contribution. Later he devoted himself almost entirely to mineralogical chemistry. At one time during his career he spent several years in the Turkish Empire under commission from the Sultan exploring the mineral resources of the empire. While thus engaged he discovered emery in Asia Minor and later described its geology to the French Academy. His attention in his mineralogical work was principally directed to the perfecting of methods of analysis, one of which, the determination of alkalies in silicates, is standard to this day. His collection of meteorites, now in possession of Harvard University, was made during his later years. He was one of the founders and second president of the American Chemical Society and had been honored by scientists and governments of many countries. His longest connection was as professor of chemistry at the University of Louisville, although throughout his earlier life he lived up to his self-given sobriquet, "the peripatetic philosopher," travelling from place to place with his laboratory in a trunk and working wherever he found himself.



Lawrence Smith

OLIVER WOLCOTT GIBBS.

(1822-1908)

"Gibbs was a pioneer in the introduction of research into the requirements of American universities. His contributions to chemistry were many and important, particularly in the fields of inorganic and analytical chemistry, wherein he not only discovered many new substances and devised many new methods but he laid such broad foundations and laid wide such an expanse of territory as to furnish opportunities for many to follow him profitably.

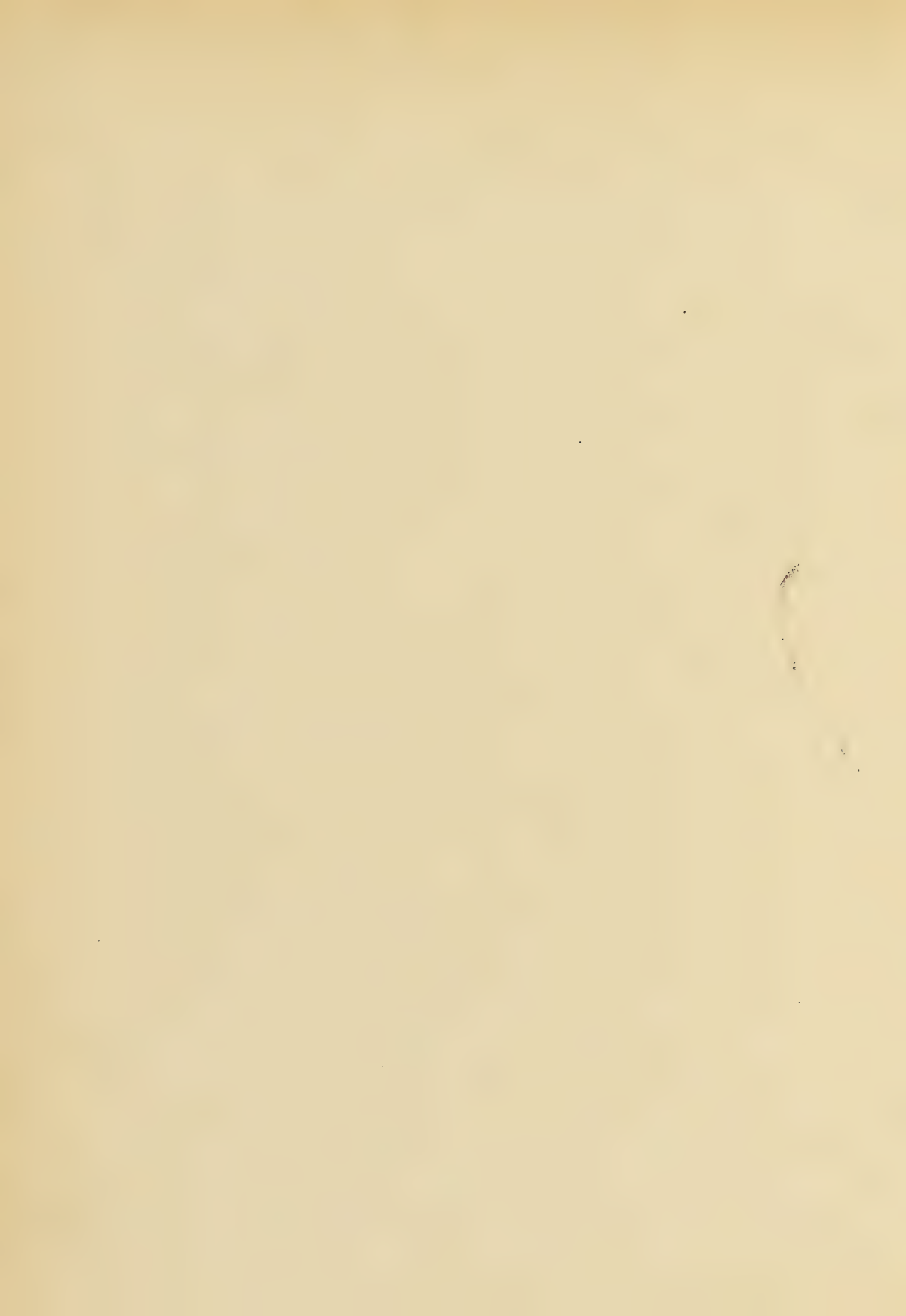
"But his interests in science were catholic and he not only took a keen interest in the developments in physiological, technical and other fields of chemistry, but he made important contributions to physics; he found a pastime in astronomy, and * * * delight in the pursuit of botany."

—Memorial Resolutions of the A. C. S.

Gibbs' principal contributions to chemical knowledge were in the study of complex ammonia bases, double compounds and acids of metals, and of the metals of the platinum group. He taught at the College of the City of New York and as Rumford Professor of Chemistry at Harvard University.



Worcester Gibbs



THOMAS STERRY HUNT.

(1826-1892)

Chemist, geologist and mineralogist, Hunt's work covers a broad field. His contributions to the theory of chemistry and to analytical methods in mineralogy are particularly noteworthy. His investigations included many of a geological nature, among others may be mentioned his theories on the formation of the earth. He was one of the founders and later president of both the Royal Society of Canada and the American Chemical Society. He was joint inventor with Douglass of a wet process for the extraction of copper from low grade ores. Although most of his active life was spent as a teacher, we find little mention of this phase of his activities in estimates of his life and work, all of which lay greatest emphasis on his ability as an experimenter and as a theorist. He was a student of the elder Silliman and spent a large part of his active life at McGill University as a teacher of chemistry and geology.



J. Sterry Wink

JOSIAH PARSONS COOKE.

(1827-1894)

An able teacher and a brilliant investigator, Cooke raised the chemical department of Harvard College from a state of collapse to a leading position among American colleges. His investigations in the field of mineralogical and inorganic chemistry were most fruitful. His determination of the atomic weight of antimony is among the classics of chemical research. He applied crystallographic methods to the study of antimonous iodide and arrived at a probable explanation of its dimorphism. He devised many methods of analysis and many pieces of lecture table apparatus. Most notable among his achievements was his theory based on the numerical relations between the atomic weights, which foreshadowed the periodic system later worked out by the Russian Mendeleeff. His books were widely popular and ranged in subject from chemical theory to the relation between science and religion. He was a brilliant popular lecturer.



Josiah P. Cook

JOHN WILLIAM MALLET.

(1832-1912)

The chemist of the Confederacy. A British subject throughout his life, Mallet came to America at the age of twenty-one and later was placed in charge of the manufacture of munitions for the Confederate Army during the Civil War. He was a great teacher, especially distinguishing himself in the chair of chemistry at the University of Virginia. Of his more than a hundred original papers published, the most important deal with the determinations of the atomic weights of lithium, aluminium and gold. Among his contributions were the analyses of many rare minerals. He was among the founders of the American Chemical Society, one of its first vice-presidents and later its president.

For many years, Mallet and Remsen were the outstanding exponents of chemical research in America, and to these two belongs the greater part of the credit for the up-building of American chemical research.



J. W. Mallet

CHARLES FREDERICK CHANDLER.

(1836——)

“Dean of American Industrial Chemists.”

Chandler aided in the establishment of the School of Mines, Engineering and Chemistry at Columbia University, which institution he served as professor of chemistry for forty-six years and as dean for thirty-three years. This was the first school of its kind in America. In addition he assisted in the upbuilding of the College of Physicians and Surgeons, of which he was professor of chemistry, and of the New York College of Pharmacy, which he served both as professor of chemistry and as president.

His greatest public service was in the application of scientific knowledge and his genius for organization to public welfare and health. He was the first chemist of the New York Board of Health, of which he was later president, and was a pioneer in the regulation of plumbing and drainage and of nuisances against health. Most noteworthy among his achievements in this field were his investigation of the flash point of kerosene and the passage of laws based upon his findings which put a stop to the daily death toll from the use of unsafe kerosene in lamps at the time.

As an industrial chemist, his genius aided in building up the sugar refining, petroleum refining and illuminating gas industries, to mention but a few, and he devised the system of assay ton weights used by every assayer in the world today.

His genius for organization made him the leading spirit in the organization of the American Chemical Society and of the Chemists' Club. He founded and edited the *American Chemist* until he had arranged for the publication of the *Journal of the American Chemical Society*.

The Perkin Medal, among his other honors, was presented to him “for such valuable contributions to applied chemistry that he has placed the entire world in his debt, and brought added prestige and dignity to the profession of which he is such a conspicuous ornament.”



C. F. Chandler

EDWARD WILLIAMS MORLEY.

(1838-1923)

In an elaborate series of investigations to which Morley gave more than ten of the best years of his life, the densities of hydrogen and of oxygen gases were determined with an accuracy that has never been reached by any other observer. He effected for the first time the quantitative synthesis of water, weighing both the hydrogen and the oxygen as well as the water formed by their union.

In the realm of physics the Michelson-Morley experiments, on the transmission of light in the direction of the earth's motion in space and perpendicular to it, formed the basis for the modern theory of relativity, and have gone far, in the minds of physicists, to disprove the existence of the cosmic ether.

Throughout his active life he was connected with Western Reserve University, where all his investigations were made.

"He carried out his work with such an ingenuity in the execution of details, and with such accuracy, that at present there is no indication that the work will need to be repeated for a century."

W. A. NOYES.



Edward W. Morley.

JOSIAH WILLARD GIBBS.

(1839-1903)

The greatest single contribution to theoretical chemistry by an American came from a man who was not in the accepted sense of the word a chemist at all, J. Willard Gibbs, professor of mathematical physics at Yale University for thirty-two years. In 1876-78 Gibbs published a series of papers on equilibria in heterogeneous systems upon the amplification of which the greater part of modern physical chemistry is built. The principles which he there set forth, including the well known "phase rule" in addition to many other fundamental relations, were so masked from the chemists of the time by their mathematical presentation that it was many years before they were applied to chemical problems and in the meantime many of them had been rediscovered by other investigators who were entirely ignorant of Gibbs' work. "Even more remarkable than the results," says Bumstead, "and perhaps of even greater service to science, are the methods by which they were attained; these do not depend upon special hypotheses as to the constitution of matter or any similar assumption, but the whole system rests directly upon the truth of certain experimental laws which possess a very high degree of probability. To have obtained the results embodied in these papers in any manner would have been a great achievement; that they were reached by a method of such logical austerity is still greater cause for wonder and admiration. And it gives to the work a degree of certainty and an assurance of permanence in form and matter which is not often found in investigations so original in character."



J. William Gibbs

HARVEY WASHINGTON WILEY.

(1844——)

Father of the Pure Food Law. Wiley's work on foods, both from a legal and a chemical point of view, is monumental. As chief of the Bureau of Chemistry for nearly thirty years, he devised methods of analysis for all the common foodstuffs and their adulterants, built up public sentiment against impure foods, drafted the pure food law of the United States and led in its enforcement. In addition to this great work he and his co-workers contributed substantially to agricultural chemistry, especially to the chemistry of cereals and soils. He was largely instrumental in the development of the beet sugar industry in this country and introduced chemical control into the cane sugar industry.



H. M. King

IRA REMSEN.

(1846—)

"Remsen is most widely known through his text books, which have reached every quarter of the globe and have been studied by tens of thousands of students from high school to university. He is best known to the initiated for the long list of researches he has carried out. He will be longest known for the *American Chemical Journal* which he founded and conducted for thirty-five years, and into which he gathered such a large proportion of American chemical literature for that period. He is best loved and most revered by those who have attended his inimitable lectures and have come in close contact with his inspiring personality. More than any other man he typifies American chemistry, for the excellent reason that he has had such a large part in shaping American chemistry.

"Remsen came into American chemistry during its formative period when his leadership counted for most. Many who were later to mold chemical thought and practice were themselves molded by him. He taught a few hundred; they have taught many thousands. Comparatively few of his students went into commercial chemistry, but a number of these have been prominent figures in some of our largest industries and have carried Remsen's ideals with them. He has never taken out a patent or turned his hand to commercialize any of his discoveries, and has always taught pure chemistry, and yet few men have had so great an influence on applied chemistry."

E. EMMET REID.

His active life has been spent as professor and president at Johns Hopkins University. Here, he was an active member of a small band of men, who, under the leadership of President Gilman, developed the graduate school of research which is the outstanding feature of the American university today. Among his signal honors was the recent presentation to him of the first impression of the Priestley Medal of the American Chemical Society.



J. R. Rumsen.

FRANK WIGGLESWORTH CLARKE.

(1847——)

Since 1883 chief chemist for the U. S. Geological Survey, Clarke's most notable contributions have been in the field of mineralogy, geo-chemistry and thermo-chemistry. For ten years he was the only member of the Committee on Atomic Weights of the American Chemical Society and since its formation he has been chairman of the International Committee on Atomic Weights. His most notable publications are "Data of Geo-chemistry," published by the Geological Survey, and "Constants of Nature," in addition to many other shorter papers. His Memorial Address before the Chemical Society (London) on Dalton was the only one delivered before that august body by an American citizen. He early attained prominence and was mentioned in the earliest American biographical dictionaries.



J. W. Clarke

WILLIAM FRANCIS HILLEBRAND.

(1853——)

Hillebrand's active life has been devoted to the subject of analytical chemistry. Not of the hit-or-miss type of the ordinary commercial laboratory but of the type in which each analysis becomes of the order of importance of an atomic weight determination. In exact analysis and in the development of methods of exact analysis, he stands far above any other American chemist. For twenty-eight years chemist in the U. S. Geological Survey, his work has been directed chiefly along the line of mineral analysis which he has lifted to the highest plane. Since 1908 chief chemist of the Bureau of Standards, he has been largely instrumental in the preparation and standardization of the standard samples of that Bureau upon which so large a proportion of the analytical work of American chemists depends for accuracy. Both in this way and through his published methods of analysis, his influence on analytical chemistry throughout the world has been immeasurable. He was the first to suggest the possibility of recovering potash from the fumes of cement kilns. As president of the American Chemical Society, he initiated the movement which led to the publication by the Society of the *Journal of Industrial and Engineering Chemistry*.



W. F. Hillebrand

EDGAR FAHS SMITH.

(1856——)

"A teacher of chemistry for 44 years, 21 of which were combined with administrative service, first as Vice Provost and then Provost of the University of Pennsylvania, Dr. Smith's career may be summed up as one which for length and richness has seldom, if ever, been equalled, in the history of American collegiate education. An enthusiastic, inspiring teacher, an able and efficient administrator, he fairly won the title of the 'best beloved college president of his generation.'

"* * * Gifted with rare ability as an investigator, his contributions in chemistry have made his name familiar to students of science throughout the world. More than 200 scientific papers have been published by him, as well as numerous books on chemistry. His monumental work on 'Electro-Analysis' has reached six editions and has been translated into French, German, Italian, and Russian. Tungsten, molybdenum, columbium, tantalum, the separation of the rare earths, and the constitution of complex inorganic acids, have particularly engaged his attention. His work in the field of atomic weights is characterized by marked originality.

"In his valuable contributions to the field of historical chemistry, Dr. Smith has accomplished that rare thing—the imparting of literary charm to a scientific subject. Opening a door more than a century old he has let us peep at the babyhood of American chemistry. * * *"

W. T. TAGGART.



Edgar F. Smith

RUSSELL HENRY CHITTENDEN.

(1856——)

Pioneer in the field of physiological chemistry in America. Chittenden's researches on digestion and diet were among the first really scientific studies of those subjects and on his results have been built the greater part of our present knowledge of them. In teaching physiological chemistry for forty years, he was the first to give medical students a real conception of the relation of chemistry to life processes. His many books and his earlier yearly reviews of research on the subjects in which he worked have been widely received as standards and have greatly stimulated the work of other investigators. Throughout his career he has been much sought as a toxicologist, a field in which he reached early proficiency. As dean of the Sheffield Scientific School of Yale University, he served for twenty-four years, during which time he added greatly to the efficiency and prestige of the school.

"Chittenden is a great teacher * * *. He developed in his students enthusiasm and the spirit of research. As an investigator he has always been noted for brilliance, originality, and thoroughness. As an executive, his keen business sense and judgment of men have been a great asset to his university. As a dean, * * * his wholesome and inspiring influence on his students has in a measure compensated for the years in which he was removed from active scientific work."

W. T. READ.



Russell H. Chittenden

WILLIAM ALBERT NOYES.

(1857——)

Noyes has been definitely identified with the development and establishment of America's position in chemical research. His researches on the atomic weight of chlorine and on camphor and its derivatives and his work on the electro-chemical theory of valence show him to be a great chemist. The development of the *Journal of the American Chemical Society* to a position in the first rank of chemical publications in the world, and of the scientific series of monographs of the American Chemical Society under his editorship show him to be a well informed scientist and a great editor. His text books and the development of the chemical department of the University of Illinois under his guidance show him to be a great teacher and an executive of no mean ability.



William Albert Noyes

EDWARD CURTIS FRANKLIN.

(1862——)

Franklin's great work has been the study of the system in which liquid ammonia replaces water. In this vast field he has spent nearly thirty years studying solubilities, conductivities, vapor pressures, chemical reactions and optical properties of all manner of substances in liquid ammonia solutions. This subject he has covered in a most thorough-going manner, leaving very few possible lines of investigation without working them out to the end. In this way he has brought our knowledge of the system of compounds which exist in liquid ammonia to a high state of clarity. In addition to his principal work, he has conducted important investigations in the fields of the nitrogen compounds of mercury and of the organic nitrogen compounds, notably the amines and the nitriles.

Few other American chemists possess personal charm of manner to the degree that Franklin does and even fewer possess the ability to carry their researches to the degree of completeness he has attained in the field of liquid ammonia. The later portions of his work have been carried out at Leland Stanford University.



E. J. Hankins

LEO HENDRIK BAEKELAND.

(1863——)

Although born in Belgium, no more loyal American lives than Baekeland. His work has been almost exclusively in the industrial field since his coming to this country in 1889. He invented and made commercially successful the first photographic developing-out paper, velox,—which could be used without a dark room,—and the phenol-formaldehyde group of plastics, under the name of Bakelite. His work in the commercial development of the Townsend electrolytic cell was of primary importance to those industries centered around the hydro-electric power at Niagara Falls. His published work has been along the lines of photo-chemistry, electro-chemistry and plastics and has been principally in the form of patents. He has the unique distinction of being the only individual to date (1924) to receive four of the five recognized American chemical medals.



L. H. Baekeland

ARTHUR AMOS NOYES.

(1866——)

A staunch supporter of the theory of electrolytic ionization, Noyes has directed most of his attention to the rigorously accurate conductivity measurements upon which the final proof of the theory rests. In this his accuracy of manipulation and of thought have placed him in a position of foremost authority. His system of qualitative analysis, based upon this theory, stands out as a masterpiece. As a teacher, much of his method of accurate experimentation and of accurate deduction from his work has been passed on to other American leaders in chemical science. Under his direction classic after classic in the field of research has been completed and published, particularly in the field of conductivity measurements at high temperatures.

The work of Noyes in research has placed him among the comparatively few American chemists of truly international standing. It was in no small part through his efforts that the Massachusetts Institute of Technology has reached its high place among schools of engineering education.



Arthur A. Norges

MOSES GOMBERG.

(1866——)

A Russian by birth and an organic chemist of the highest type, Gomberg has devoted more than twenty years to the study of those compounds which exist as free radicals, i. e., in which the carbon atom appears as trivalent. Triphenylmethyl and its derivatives have been studied in the most thorough-going manner. Speaking of Gomberg's work in 1914, Hesse said:

"Those acquainted with the published work of Professor Gomberg recognize that it fulfills and typifies the highest ideals of research. Starting out to obtain the answer to a definite problem in a carefully planned and definite way, he came across something new, unexpected and unusual. His patient, laborious and ingenious examination of this led to the work which has consumed much of his time and effort for the past eighteen years and has given to chemistry a new class of substances—triphenylmethyl and its derivatives."

Gomberg is highly successful as a teacher at the University of Michigan where he has been throughout his active career.



M. Gombert

JULIUS OSCAR STIEGLITZ.

(1867——)

A brilliant worker in the field of organic chemistry, Stieglitz has done much to explain the mechanism of organic reactions. His outstanding accomplishments have been in the study of molecular rearrangements, catalysis, the stereo-isomerism of nitrogen compounds, the solubility product, the theory of color production, and the application of the electron theory of valence to organic compounds. In addition to the immense amount of research which this able man has carried on, he has occupied the unique position of being for many years the connecting link between chemistry and American medicine. His influence has been of inestimable value to both professions, and the establishment in America of an industry devoted to the manufacture of organic medicinal compounds is due in no small measure to his efforts. His work has been conducted at the University of Chicago.

“As an inspiring teacher, Stieglitz has handed on the torch of his spirit to many of the active young men and women on whom today depends the present progress of chemistry both in research and industry.”

H. G. BYERS.



Julius Stieglitz

WILDER DWIGHT BANCROFT.

(1867——)

Physical chemistry owes much to Bancroft, investigator, teacher and editor. As an investigator he was a pioneer in the field of the chemistry of colloids. His contributions on the applications of the phase rule, and of the law of mass action, to electro-chemistry, on alloys, on irreversible reactions and to the chemistry of light are of fundamental importance.

Founder of the *Journal of Physical Chemistry*, its editor from its inception, and now chief of its international staff of editors, his contributions to the progress of physical chemistry in the English speaking world have been immeasurably great.

As a teacher and lecturer, he possesses the rare gift of being able to excite and hold the interest of his hearers in the most abstruse subjects. Probably no man living has so wide a knowledge of chemical literature as Bancroft.



Wilder D. Bancroft

THEODORE WILLIAM RICHARDS.

(1868——)

Master of the determination of atomic weights. Richards has determined the atomic weights of no less than twenty-two of the elements with an accuracy that has led to the acceptance of his values in every case where they have differed in the slightest degree from those previously accepted. His work on the atomic weight of lead from radioactive sources stands as one of the great classics of chemical research, and for it he was awarded the Nobel prize in chemistry for 1914. In addition to his atomic weight determinations, Richards has done much work in the field of the compressibility of the atoms and the significance of changes in atomic volumes. Other phases of physical and inorganic chemistry have occupied his attention but the results so far achieved are of less importance than his atomic weight determinations and the new methods which he has given the world in this field. His work has been done at Harvard University, where he is director of the Wolcott Gibbs Memorial Laboratory. He has the unique distinction of having served as exchange professor of chemistry at the University of Berlin, among his many other honors.



T. w. Richard

WILLIS RODNEY WHITNEY.

(1868——)

Whitney organized and has since directed the first great research laboratory in this country devoted to carrying out investigations for a great industrial corporation. In this he shows his broad-mindedness by associating with himself men of the broadest theoretical training, with the result that this laboratory is now the greatest of its kind in the world. Under his direction many of the remarkable industrial developments of our day have been made. Ductile tungsten and molybdenum, pure boron, the Coolidge X-ray tube, the nitrogen filled incandescent lamp, the work of Langmuir on the reactions of gases at low pressures, and the electronic relays of wireless telephony, these are typical of the problems which have occupied the laboratory of this remarkable man and which show by their diversity his great breadth of vision. His own researches have been along the lines of solubilities, corrosion of iron and steel, and the nature of suspensions and colloids. His outstanding characteristic is his dynamic personality, the influence of which has been felt not only in his own laboratory but throughout the whole field of industrial research.



U. R. Whitney

BERTRAM BORDEN BOLTWOOD.

(1870——)

Boltwood is the leader in America in research on radium and radio-activity. The origins of and the genetic relationships between radio-active elements have principally occupied his attention. Working early in his career on the rare earth metals, he later became interested in uranium. He demonstrated that radium is a disintegration product of uranium and showed that lead was the final product of its disintegration. On the basis of these conclusions he devised a method of measuring the age of uranium minerals by determining the relative proportions of lead and uranium present. In a prolonged search for the parent of radium, he discovered the radio-element, Ionium, in 1908. His work has been done at Yale University in both the departments of physics and chemistry in teaching and executive chairs.



Bertam B. Bollwood

GILBERT NEWTON LEWIS.

(1875——)

A brilliant worker in the field of thermodynamics, Lewis has distinguished himself by his studies of entropy, free energy and the theory of valence. His contributions to the application of the third law of thermodynamics to chemical problems have been particularly brilliant. The structure of the atom and molecule and the theory of valence have been fruitful subjects of his investigations. Other contributions have been on the subject of ionic theory, electric potentials of the elements, equilibrium in reactions, and the specific heat of electrons. His mathematical turn of mind has led him to investigations of the theory of relativity, four dimensional vector analysis of electro-magnetic theory, and to the development of a system of non-Euclidian geometry. Largely through the efforts of Lewis, the Department of Chemistry at the University of California has risen to a position of leadership among American universities.



Jillat M Lewis

FREDERICK GARDNER COTTRELL.

(1877—)

Primarily a physical chemist, Cottrell's most important contribution has been his method of electrical precipitation of suspended particles from gases. This has been successfully applied to the precipitation of arsenic and sulfuric acid from smelter fumes and to the demulsification of crude petroleum from the California fields. Its use in the recovery of potash from the flue gases of cement kilns has made this source of this valuable fertilizer of considerable importance. Liquefaction of gases, particularly air, and the recovery of helium from natural gas have been subjects of his study. In both scientific and administrative capacities he has served the Bureau of Mines and the Fixed Nitrogen Laboratory, of which he is now chief. He has been intimately connected with the work of the National Research Council.

Throughout his life, Cottrell has submerged himself and his personal advantage for the public good.



F. J. Collier

IRVING LANGMUIR.

(1881——)

Four outstanding pieces of research have placed Langmuir in the fore-front of chemical scientists. His studies of gas reactions at low pressures, his work in molecular physics, his theory of the structure of the atom and his researches in thermionic phenomena and electron emission from heated bodies stand as achievements of the first magnitude. Industrially his work has been along the lines of the development of gas filled tungsten lamps, electron emission apparatus in wireless telegraphy and telephony, the development of condensation high vacuum pumps, and during the war on devices for the detection of submarines. Langmuir has the unique distinction of having been awarded the Nichols Medal of the American Chemical Society on two different occasions. It is remarkable to note that Langmuir's work, highly theoretical though it is, has been carried out in the research laboratory of an industrial corporation, the General Electric Co.



Irving Langmuir

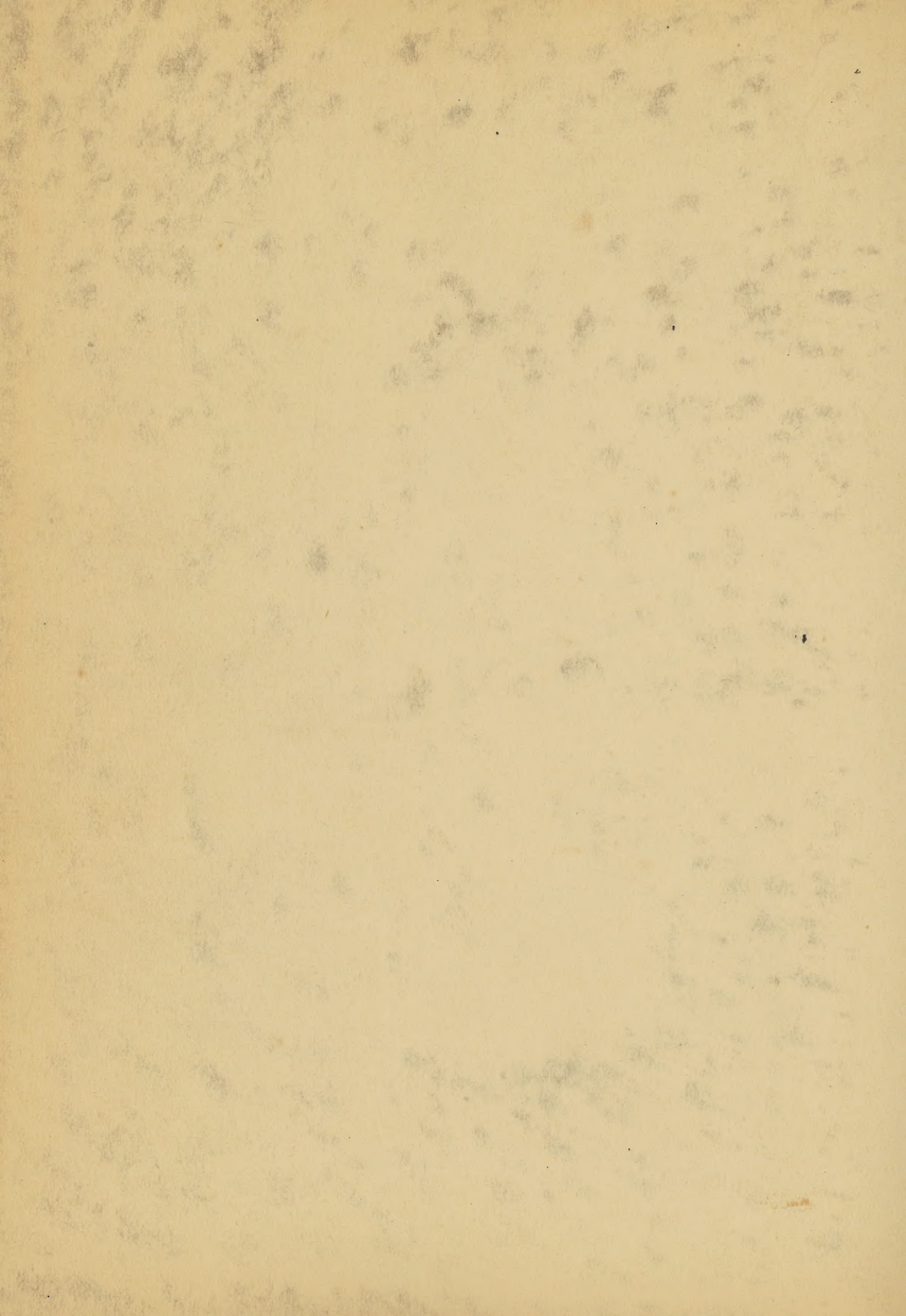
DONALD DEXTER VAN SLYKE.

(1883—)

A leader in the field of physiological chemical investigations, Van Slyke has made notable contributions to our knowledge of this subject from the laboratory of the Rockefeller Institute. His work on the chemistry of the blood, acidosis and methods of blood analysis have been of extreme importance. His studies of the chemistry and physiology of the proteins and the amino acids, of the laws of the enzyme action, and of the respiratory and renal functions have been fundamental contributions to knowledge.



Donald R. Van Slyke



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